

PROCEDURE NO. GN-HM-2371

10 October 1966

FIELD TEST PROCEDURE  
FOR  
PREFLIGHT AND POSTFLIGHT  
OF  
PILOTS' PROTECTIVE ASSEMBLY

GN-S901J

On file USAF release  
instructions apply.

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### INTRODUCTION

The purpose of this Field Test Procedure is to provide adequate instructions to technicians engaged in the field testing of the Pilots' Protective Assembly, GN-S901J.

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1.0 EQUIPMENT LIST

1.1 Test Kit DN-70700-5

Face Barrier Test Plate GN-ACS475A

Seal Screws GN-P-2024

Pressure Taps GN-PC-3040

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Section 2.0 Field Test Procedure (Pilots' Protective Assembly  
GN-S901J)

NOTE: The following tests are performed utilizing Test Kit DN 70700-5. This test kit has an operating pressure of  $70 \pm 10$  psig and incorporates a 200 cc/min. max. orifice bleed to control the loading valve. Insure pressure differential gauge reads zero in/H<sub>2</sub>O before using tester.

2.1 Before starting test, perform the following steps:

- 2.1.1 Remove seal screws from pressure tap holes located on helmet, P/N GN-P2024.
- 2.1.2 Install pressure taps, P/N GN-PC-3040.
- 2.1.3 Install face barrier test plate (GN-ACS475A) in helmet.
- 2.1.4 Attach helmet to suit and lock disconnect.
- 2.1.5 Close visor.

2.2 Vacant Suit Test

- 2.2.1 Attach pressure sensing hoses (helmet and suit) to their respective pressure taps.
- 2.2.2 Attach helmet O<sub>2</sub> hoses to dual O<sub>2</sub> supply.
- 2.2.3 Check operation of helmet O<sub>2</sub> on/off valve by opening and closing visor. Lock visor after closing.
- 2.2.4 Attach make-up leakage input hose, P/N

NOTE: Inspect condition of all hoses and disconnects and slide fasteners.

- 2.2.5 Move 2-position 3-way valve (hereafter referred to as selector valve) to "LEAK TEST" position.
- 2.2.6 Note differential pressure gauge reading.
- 2.2.7 Note leak rate reading on flowmeter.

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2.2.8 Record readings on test sheet.

2.2.9 Turn selector valve to normal.

2.3 System #1

CAUTION: Momentary decrease of O<sub>2</sub> source pressure to below 120 psi will result in the opening of the anti-suffocation valve. Therefore it may be advisable to inflate the suit using normal vent source and then transfer to the kit make-up leakage input.

2.3.1 Simultaneously turn the controller mounted pressure control valve and the test kit mounted pressure control valve until the suit pressure gauge reads  $156 \pm 2$  mm/Hg. The pressure control gauge should be set not more than 2 mm below the suit pressure gauge.

2.3.2 Turn selector valve to "LEAK TEST" position.

2.3.3 Allow the suit pressure to stabilize for a min. of 5 minutes.

2.3.4 Note the indicated leak rate on flowmeter and return valve to "NORMAL" position.

2.3.5 Slowly deflate suit by turning adjustable inflation valve counter-clockwise.

2.3.6 Record readings on test sheet.

2.4 System #2

2.4.1 Depress manual press-to-test button.

2.4.2 Adjust make-up regulator pressure approximately 2 mm below that of the suit by turning the make-up leakage pressure control valve clock-wise.

2.4.3 Turn selector valve to "LEAK TEST" position.

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- 2.4.4 Allow the suit pressure to stabilize for a minimum of 5 minutes.
- 2.4.5 Note the indicated leak rate on flowmeter and return valve to "NORMAL" position.
- 2.4.6 Deflate suit by releasing manual press-to-test button.
- 2.4.7 Record readings on test sheet.
- 2.4.8 Terminate make-up flow by turning make-up leakage pressure control valve counter-clockwise.
- 2.4.9 Disconnect make-up leakage input hose.
- 2.4.10 Disconnect helmet hoses from test kit.
- 2.4.11 Disconnect pressure sensing hoses (helmet and suit).
- 2.4.12 Disconnect the helmet from the suit.
- 2.4.13 Remove face barrier test plate.

2.5 Suited Subject Test - Note - Gross Leak Only

CAUTION: The purpose of this test is to find a gross leak that may have occurred after preflight/post flight inspection. The most common causes of excessive leakage under these conditions are pressure closing slide fastener not fully closed, underwear in wrist disconnect, face barrier not adjusted properly, damaged hardware, etc. Should the initial leakage as used on the tester exceed the specification the test should be repeated. The subject should be reminded that slight movements and/or breathing will have major effects on tester readings. Total leakage should not exceed that expected for a vacant suit, however due to the recognized difficulty in taking an occupied suited subject test a reading of 5000 cc or less is acceptable.

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Before starting tests listed below, perform the following steps:

2.5.1 Remove seal screws from pressure tap holes located on helmet.

2.5.2 Install pressure taps.

NOTE: Subject has already donned the Pilots' Protective Assembly and ventilation and communications have already been established.

2.6 Unpressurized Leak Rate (Both Systems)

2.6.1 Attach pressure sensing hoses (helmet and suit) to their respective pressure taps.

2.6.2 Perform anti-suffocation valve test by instructing subject to close visor (DO NOT LOCK) and take several deep breaths.

2.6.3 Attach helmet hoses to dual O<sub>2</sub> supply hose assembly and adapter.

2.6.4 Check operation of helmet O<sub>2</sub> on/off valve by opening and closing visor. Lock visor after closing.

NOTE: Inspect condition of all hoses, disconnects and slide fasteners.

2.6.5 Remove ready room vent source.

2.6.6 Instruct subject to hold his breath.

2.6.7 Move selector valve to "LEAK TEST" position.

2.6.8 Note differential pressure gauge reading.

2.6.9 Note leak rate reading on flowmeter.

2.6.10 Instruct subject to resume breathing.

2.6.11 Record readings on test sheet.

NOTE: Attach make-up leakage input hose before testing System #1 and #2.

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2.7 System #1 and System #2

2.7.1 Simultaneously turn the adjustable inflation valve and the make-up leakage pressure control valve until the suit pressure gauge reads  $110 \pm 10$  mm/Hg. The pressure control gauge should be set about 2 mm below this reading.

NOTE: The suit pressure gauge will fluctuate slightly as the subject breaths. Note the low point of this fluctuation and turn the make-up leakage pressure control valve slowly counter-clockwise until the pressure control gauge reads just below the low point of the suit pressure gauge about 2 mm.

2.7.2 Instruct subject to hold his breath.

2.7.3 Turn selector valve to "LEAK TEST" position.

2.7.4 While allowing the suit pressure to stabilize (5-20 seconds) observe suit pressure and differential pressure readings.

2.7.5 As the pressure stabilizes note the indicated leak rate on flowmeter and return valve to "NORMAL" position.

2.7.6 Instruct subject to resume breathing.

2.7.7 Record readings on test sheet.

2.7.8 Depress manual press-to-test button.

2.7.9 Slowly turning adjustable inflation valve counter-clockwise to full closed position.

NOTE: Suit pressure should not deflate past the System #1 (press-to-test) pressure setting.

2.7.10 Deflate suit by releasing manual press-to-test button.

2.7.11 Terminate make-up flow by turning make-up leakage pressure control valve counter-clockwise.

2.7.12 Disconnect make-up leakage input hose.



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- 2.7.13 Connect portable ventilation source.
- 2.7.14 Disconnect pressure sensing hoses (helmet and suit).
- 2.7.15 Remove pressure taps.
- 2.7.16 Reinstall seal screws.
- 2.7.17 Disconnect helmet hoses from test kit and connect to portable O<sub>2</sub> supply.

CAUTION: Only one hose at a time is disconnected from the ready room O<sub>2</sub> supply and connected to the portable O<sub>2</sub> supply in order to maintain "free breathing" capability.

NOTE: The maximum "leak rate indicated" on test data sheet for unpressurized leak includes 200 cc per min. for test kit orifice bleed. The maximum "leak rate indicated" on test data sheet for pressurized leak includes both the 200 cc for the test kit and 1400/1100 cc per min. for the controller.

Date \_\_\_\_\_

Approved For Release 2003/03/10 : CIA-RDP75B00285R000300170001-0  
 PRE/POST FLIGHT #GN- 59010 P.P.A.

DATE \_\_\_\_\_ 19 \_\_\_\_\_

LOCATION \_\_\_\_\_

ASSEMBLY # \_\_\_\_\_

HELMET # \_\_\_\_\_

CREW MEMBER \_\_\_\_\_

A/C # \_\_\_\_\_

DON \_\_\_\_\_ : \_\_\_\_\_ DOFF \_\_\_\_\_ : \_\_\_\_\_ TOTAL \_\_\_\_\_ :

ANTI-SUFFOCATION

O<sup>2</sup> ON - OFF

	<u>PRE-FLIGHT</u>		<u>POST FLIGHT</u>	<u>TOLERANCE</u>	
	<u>VACANT</u>	<u>OCCUPIED</u>	<u>VACANT</u>	<u>VACANT</u>	<u>OCCUPIED</u>
<u>UNPRESSURIZED</u>					
Dual System					
Differential	_____ in. H <sup>2</sup> O _____	_____	_____	0.8-1.4	_____
Leak Rate Ind.	_____ cc/ M _____	_____	_____	1000 Max.	_____
<u>PRESSURIZED</u>					
System #2 Adjustable					
Pressure	_____ mm/hg _____	_____	_____	156 + 2	_____
Differential	_____ in/H <sup>2</sup> O _____	_____	_____	0.8-1.4	_____
Leak Rate Ind.	_____ cc/m _____	_____	_____	3600 cc	5000
System #1 Primary					
Pressure	_____ mm/hg _____	_____	_____	110 + 10	_____
Differential	_____ in/H <sup>2</sup> O _____	_____	_____	0.8-1.4	_____
Leak Rate Ind.	_____ cc/m _____	_____	_____	3300cc Max	5000

TECHNICIAN \_\_\_\_\_

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**DAVID CLARK COMPANY INCORPORATED**  
WORCESTER, MASSACHUSETTS

061-1217

## TRAINING SCHEDULE


DATE 8 September 1967

COURSE TITLE Familiarization and Maintenance - S1010 PPA (Project 461)	
BEGINNING DATE 18 September 1967	COMPLETION DATE 29 September 1967

DATE	TIME	SUBJECT MATTER	PLACE	INSTRUCTOR	REMARKS
18 Sept.	0800-1200	Tour R & D Area where suit is in ✓ process of development	4th floor	<div></div>	STATINTL
	1300-1630	Overview of System and general ✓ description	Classroom 1		Per Tech Prop. JAR 856-1739
19 Sept.	0800-1200	Donning, Doffing, Usage ✓	"		Use 901 H & J films
	1300-1630	O <sub>2</sub> System ✓	"		
20 Sept.	0800-1200	Communications System: Microphones, receivers, cords, disconnects and penetration.	" *		* Use R & D Model Shop to show work in progress STATINTL
	1300-1630	Helmet: Construction, Visor & Sunshade, Feeding port, Suspension System (Liner) Face Barrier & exhalation valve, disconnect and neckpiece	" *		

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DATE	TIME	SUBJECT MATTER	PLACE	INSTRUCTOR	REMARKS
		Approved For Release 2003/03/10 : CIA-RDP75B00285R000300170001-0			
21 Sept.	0800-1500	Torso Assembly Comfort Liner Gas container & Vent system Restraint Layer Exterior cover Hardware Holddown Parachute Harness Flotation Assembly	Classroom 1		STATINTL
	1500-1630	Gloves and glove bladders Boots	"		
22 Sept.	0800-1630	Hardware disassembly, clean and reassembly helmet & glove disconnects	"		
25 Sept.	0800-1200	Inspections Pre flight, post flight & periodic	R & D Test room & classroom		Tie in QC & Reliability
	1300-1630	Link-Net Simple repairs, knots & ties	Classroom 1		
26 Sept.	0800-0930	Adjustments of standard sewing machines	Open		
	0930-1630	Power stitching Repairs of rips & tears in coverlayer	Open		
27 Sept.	0800-1630	Cement bonding Patches for pin hole leaks in gas container. Flock boot installation	3rd floor Production		* Instructor to be provided by Production Dept.
Approved For Release 2003/03/10 : CIA-RDP75B00285R000300170001-0					

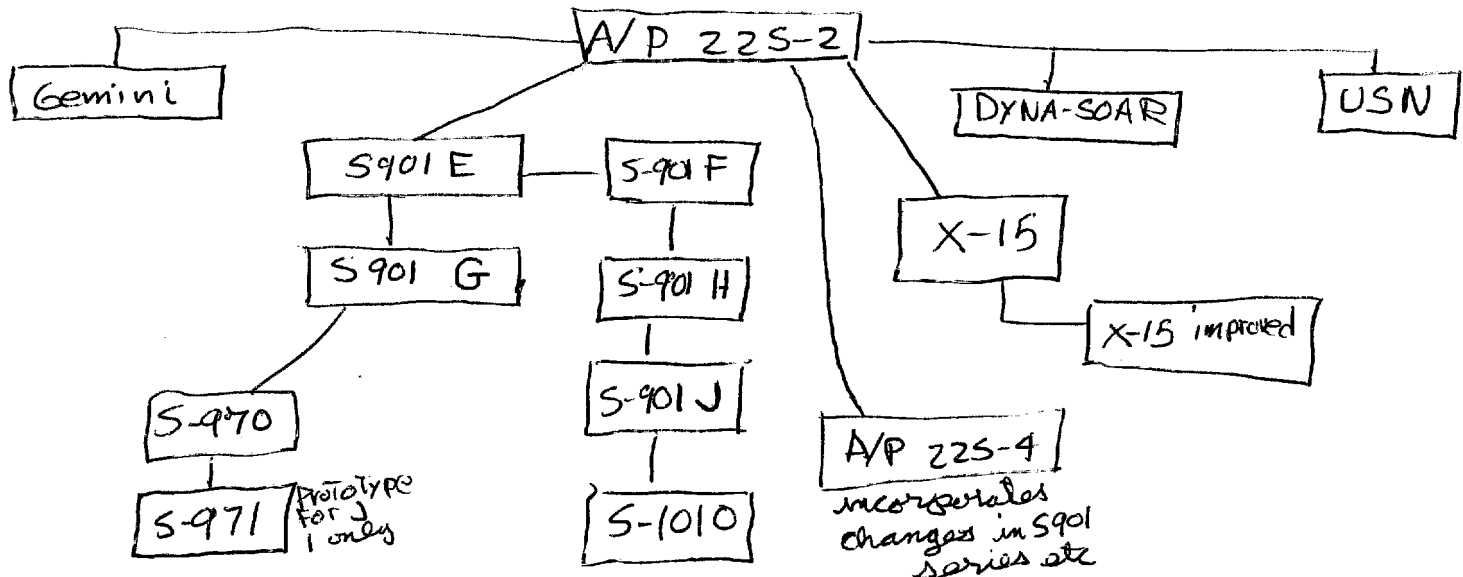
DATE	TIME	SUBJECT MATTER	PLACE	INSTRUCTION	REMARKS
Approved For Release 2003/03/10 : CIA-RDP75B00285R000300170001-0					
28 Sept.	0800-1200	Replacement of face barriers in helmet	Production Area & helmet dept.		
	1300-1630	Continue helmet: Replace components (visor, sunshade, take-up cord)	Production Area & helmet dept.		
29 Sept.	0800-1630	Open - To be used for requested material			
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19 Sept 67

## Configurations of Basic Suit Models

- ① Entry - U or R
- ② System - Dual or Single ( $O_2$ )
- ③ Sizing - Custom or Standard Size
- ④ Controller ---  $O_2$  connection or No  $O_2$  connection  
 $O_2$  bleed                      Aneroid Operated  
 $O_2$  dependent                   $O_2$  independent
- ⑤ Visor Seat --- Pneumatic or Static

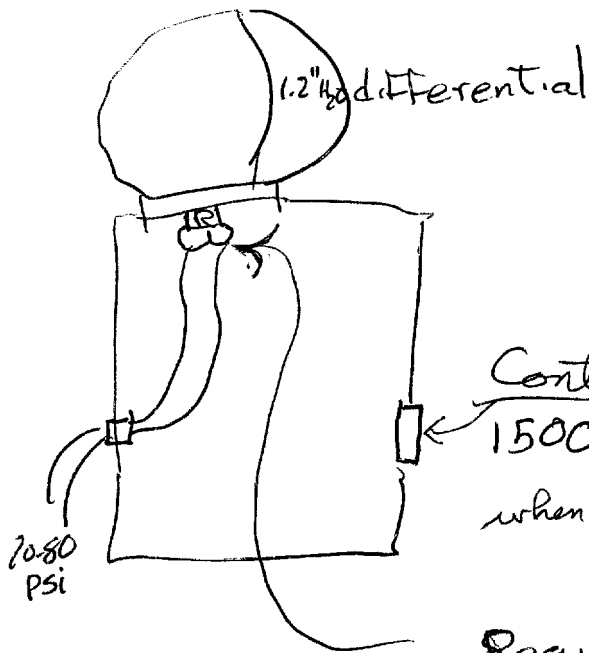
## Development of Suits



## Configuration of Individual Models

Model #	ENTRY	System (O <sub>2</sub> )	Sizing	Controller	Visor Seal	Disconnect Neck <del>ENTR</del> <del>90</del>
225-2	U	S	S	Dep	Pneu	old Lock No vent
X-15	U	S	C	Dep	Pneu	"
X-15 mp	R	S	C	INdep	Static	New
S-901 E	U	D	C	Dep	Pneu	old Lock No vent
S-901 F	U	D	S	"	"	"
S-901 G	U	D	C	"	"	"
901 H	R	D	S	"	"	"
S- <del>901 G</del>	R	D	C	"	"	"
S-970	R	D	C	"	"	"
X-15 mp	R	D	S	In Dep	Static -	Latest Lock & vent
S-901 J	R	D	S	In Dep	Static	"
S-1010	R	D	C	In Dep	Static	"
A/P 225-4	R	S	S	In Dep	Static	"

①

O<sub>2</sub> SystemPray for max flow  
120 LPM

Controller  
1500 cc/min leak rate built into  
when pressurized controller - air from suit

Regulator - built in leakage for  
control of function  
400 cc/min

Exhalation Valve 1.7" H<sub>2</sub>O setPre Flight / Post FlightVacant SuitOccupied Suit

110mm Hg (2psi) P.T.T.

- (1) Pressure Test
- (2) Differential Press.
- (3) Leak Rate

Commo  
User Heat2000 cc/min  
leak rate  
systemVacant SuitPeriodic  
30 Days / 300Separate Suit - Helmet  
TestsExtensive inspection  
O-rings  
seals  
cable  
screwsRelief Valves  
Exhalation Garment

Annual

Replacement  
itemsRubber Goods  
Replacement

Exhalation Garment



\* Coordination meeting - Eirewe/David Clark/Det/Hq  
 on Test Requirements  
 - Obtain info from  
 [redacted]  
 Boole

STATINTL

### Rubber Goods Coded

Replace on failure or excess leakage  
 Replace annually  
 Replace unit w/ rubber component

Sealation Garment } cylinder - torque  $60^{+10}_{-0}$  in lbs  
 & reverse torque test

Pressure Drop  
 1 hr time lapse

### Flowmeter

10-15 min

Inflate to 2 psi  
 Use adapter

Inflate through OIT  
 2psi source - flowmeter  
 -- 50 cc/min

Cylinder weight  
 Setting into actuator  
 ↳ to water manometer  
 Inflate to 12" H<sub>2</sub>O - by OIT  
 5 min adjust to 11" H<sub>2</sub>O  
 Pres (allowable) is 3" ΔP  
 In garment

## Excessive Leak on Preflight/occupied

- ① Face seal adjustment
- ② Wrist disconnect (underwear caught)
- ③ Neck Disc. (wrist seal)
- ④ Main Press. Sealing Trigger
- ⑤ Vent flapper valve
- ⑥ Hardware openings
- ⑦ Ex Valve setting Low

## LESSON OUTLINE

WHEN: 18 September 1967 1300 - 1630 hours  
WHERE: Classroom #1 4th Floor (R & D)  
SUBJECT: S-1010 Pilot Protective Assembly  
Overview of system and general description

S-1010 (Prototype)

"J" Suit and Helmet (compare)

Harness (Sample) — *check necessity of lower abdominal cross strap. . . check USN MA-2 Harness*

Helmet — *check - length of comm cord - parachute connection*

Hardware

Technical Proposal

Helmet Linder Assembly and A2282 Helmet

## LESSON OUTLINE

**WHEN:** 19 September 1967 0800-1200 hours

**WHERE:** Classroom #1

**SUBJECT:** S-1010 PPA  
Donning, Doffing, Usage

**Films:** S901 H & J

**Function**

**Seat (Stabilized/unstabilized)**

**Major Improvements/change**

**Pre-post flight, periodic, annual tests and inspections (Use "J" data and R & D Test room)**


## LESSON    OUTLINE

WHEN:                    19 September 1967                    1300-1630 hours

WHERE:                  Classroom #1

SUBJECT:                S1010 PPA

O<sub>2</sub> System

Prints                    O<sub>2</sub> Entry     Helmet disconnect

O<sub>2</sub> Hardware

Operational and static function and hook-up

System routing, pressure, breathing cycle, Demand-flows.

## LESSON      OUTLINE

WHEN:                      19 September 1967                      1300-1630 hours

WHERE:                    Classroom #1

SUBJECT:                   S1010 PPA

O<sub>2</sub> System

Prints                      O<sub>2</sub> Entry      Helmet disconnect

O<sub>2</sub> Hardware

Operational and static function and hook-up

System routing, pressure, breathing cycle, Demand-flows.